Broadband Characterization of a Compact Zero-Bias Schottky Diode Detector With a Continuous Wave

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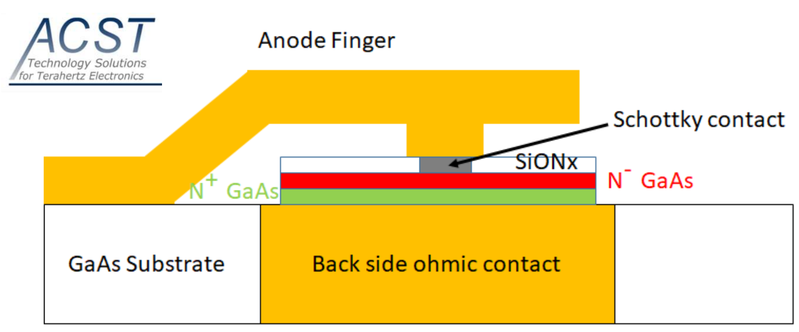
(WEPP11)

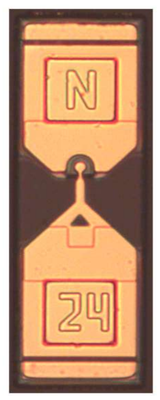
MOTIVATION

- **Zero bias Schottky diode detectors:** less noise due to absence of shot noise
- Development of room temperature broadband Terahertz (THz) detectors for diagnosis and control of THz generation at particle accelerators
- Improving detection of ultra-short pulses with picosecond length [1-3] at accelerator facilities such as Free Electron Lasers (FELs) → Large video-bandwidth necessary
- Detector characterization with commercial Continuous Wave (CW) source
- Optimization of the post detection electronics and detector packaging circuitry for THz domain applications

QUASI-VERTICAL SCHOTTKY DIODE



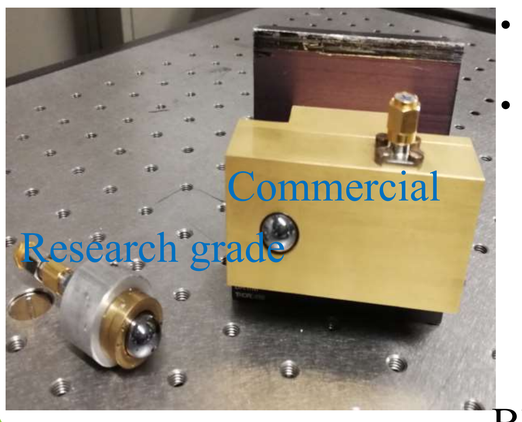
Cross section schematic



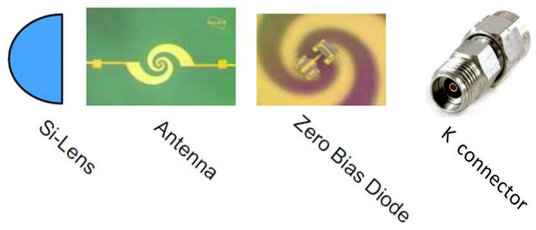
Fabricated diode

Source:[4]

CHARACTERIZED DEVICES

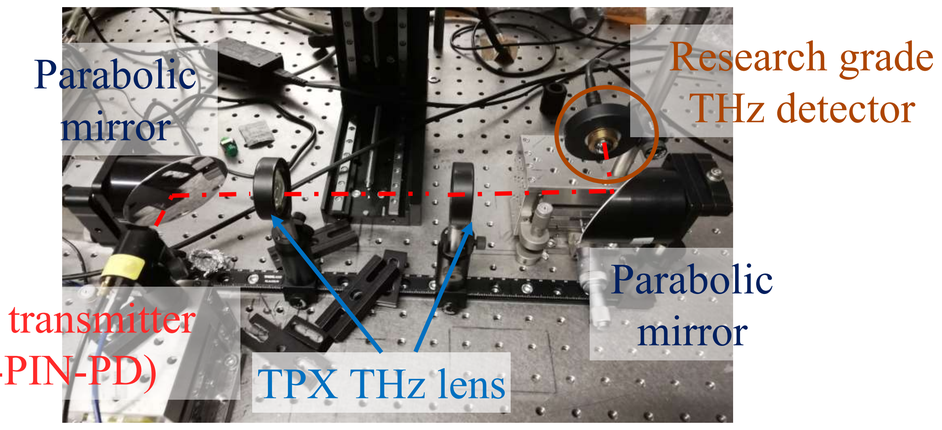


- **Research grade: improved Bandwidth (K connector)**
- **Commercial: medium Bandwidth (SMA connector)**



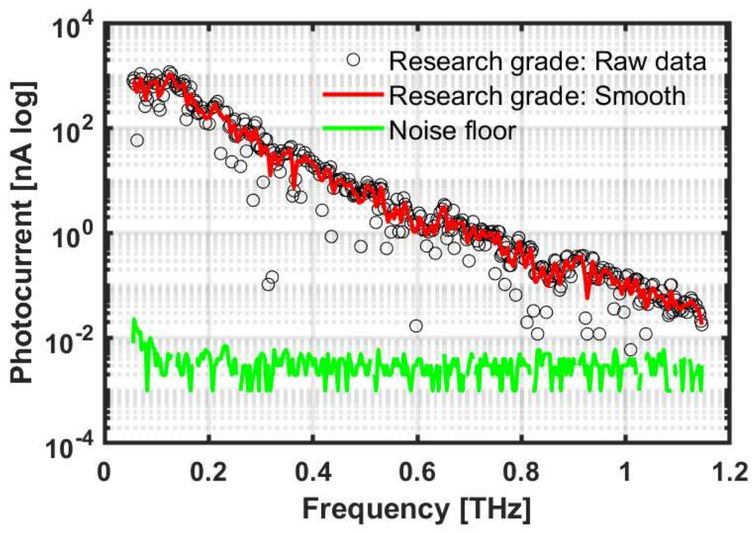
Block diagram of both THz detector

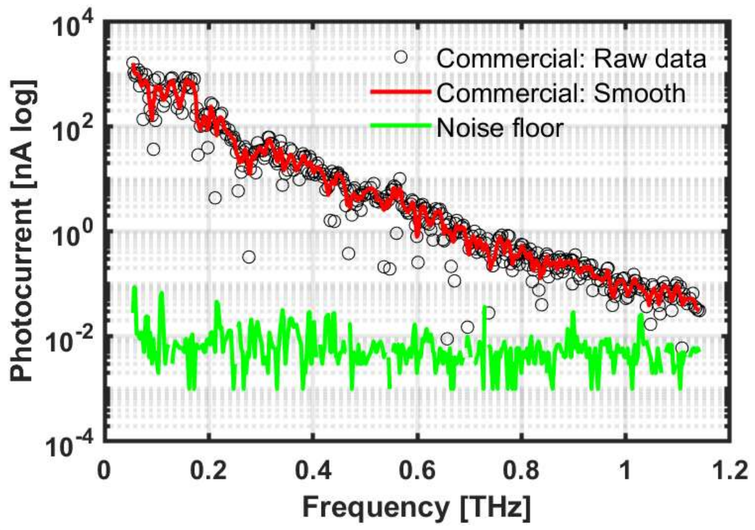
EXPERIMENTAL SETUP



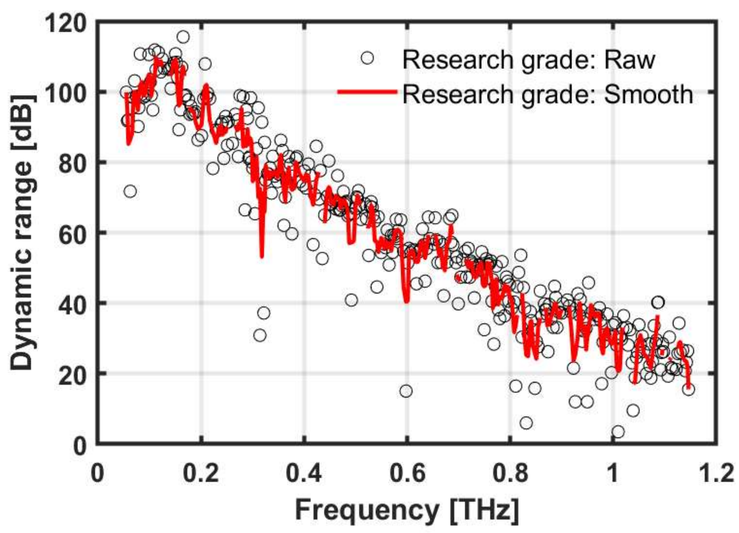
RESULTS

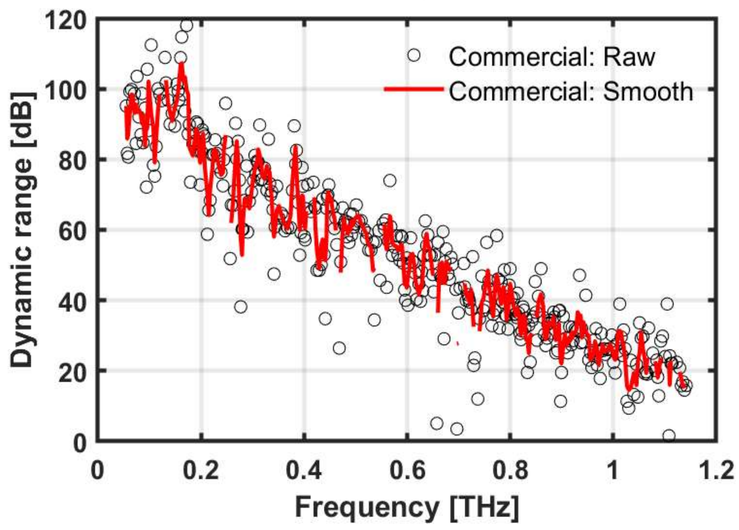
Rectified photocurrent



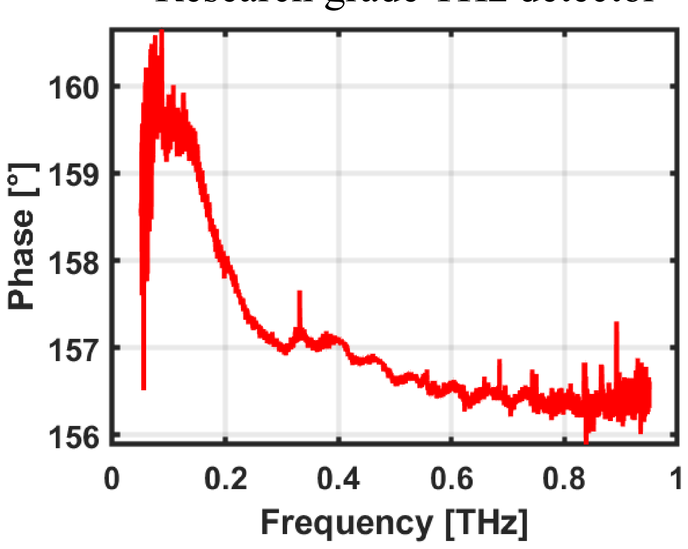


Dynamic range of setup

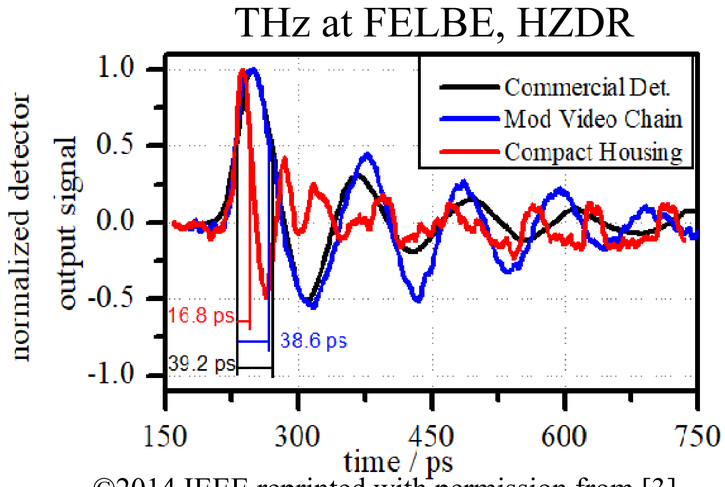




Phase of rectified current from Research grade THz detector



Detector characterization at 1.3 THz at FELBE, HZDR



CONCLUSION AND OUTLOOK

- Broadband characterization of commercial and research grade zero-bias Schottky detectors
- Research grade detector with improved IF path has 7 dB higher dynamic range at 1 THz compared to commercial one
- Improved IF path can detect much shorter pulses compared to its counterparts at FELBE
- Optimizing IF circuitry and THz packaging

ACKNOWLEDGMENT

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REFERENCES

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